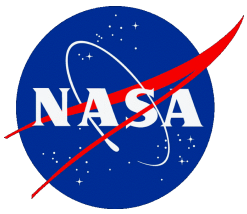
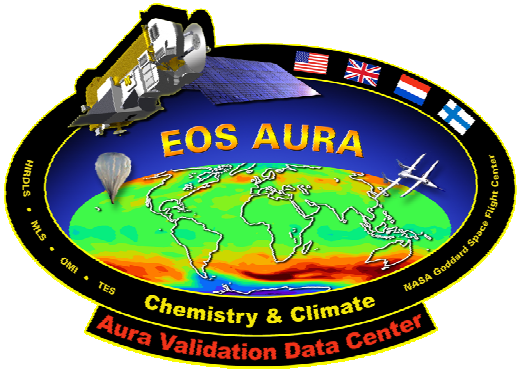


National Aeronautics and
Space Administration

Goddard Space Flight Center
Greenbelt, MD



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Abstract:	This document describes how to use the idlcr8ascii.pro and idlcr8ascii.sav programs to read in and, if required, generate ASCII output from HDFv4.2 files stored on the AVDC, NDACC, and ESA ENVISAT (NILU) databases.
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1 Overview

These IDL programs (idlcr8ascii.pro and idlcr8ascii.sav) read the Global Attributes and Scientific Datasets of AVDC/NDACC/ESA ENVISAT compliant HDFv4 files (Bojkov et al., 2002, 2005) and compatible format HDF5 files (i.e. those created by idlcr8hdf.pro or cr8hdf.exe). Options are available to generate ASCII files containing the metadata (Global and Variable Attributes) and data, or a summary of the contents of the HDF file (sent to the IDL output log, and/or a logging window). If running the program on a fully licensed version of IDL (IDL LIC), it can also return the Global Attributes in an array and the Variable Attributes and the Data in a heap structure using pointers.

This program uses predefined HDF routines for reading HDF files. It has been tested on IDL version 5.4 (which uses the NCSA HDF library v4.1r3) and IDL version 6.3[1]. Input can either be by command line (IDL LIC) or by DIALOG_BOX prompts (IDL LIC, or IDL Virtual Machine (IDL VM)).

For users who do not have an IDL license, IDL VM can be downloaded free from http://www.ittvis.com/idlvm. The resulting download is the full version of IDL. The user can install IDL VM only, or the full version (including IDL VM). The full version can only be used in 'Demo' mode without a license. IDL VM executes the binary version of the code (idlcr8ascii.sav). Refer to Chapter **3** for details.

2 Running idlcr8ascii.pro on IDL LIC

2.1 Run-time Options

idlcr8ascii.pro can be run as a standalone program or called by another program, by compiling the program (.r idlcr8hdf) and calling the main procedure, idlcr8hdf, at the IDL prompt or from another program. The full command line, including parameters is:

idlcr8ascii [,HDFFileSpec[,GA,SDS[,/AVDC][,/Dump][,/Catalog]]]

Possible run-time options are:

- Calling the procedure with no parameters (idlcr8ascii) – An 'Introduction' pop-up box will be displayed, and the user has the option of continuing with DIALOG_BOX prompts, or stopping the program. This is equivalent to running the program on IDL VM (see Chapter **3**).
- Session Memory Option – Inputs are a single HDF filename. The program must also be called with two additional parameters to hold the global attributes (returned in a string array), and the variable attributes and data (returned as a structure). If wanting to use a pop-up DIALOG_BOX to choose the HDF file name then insert a null string in place of the filename in the procedure call e.g.

[1] To determine the HDF library used on your version of IDL call HDF_LIB_INFO, Version=ver.

idlcr8ascii,'',GA,SDS. It is also permissible to include Option keywords in the procedure call e.g. idlcr8ascii,'',GA,SDS,/AVDC,/Catalog.

- Non-Session Memory Options – If GA and SDS parameters are not included in the command line, it should include one or more Option keywords e.g. idlcr8ascii,'',/AVDC. If only an input HDF file name (or spec) is included, the 'Introduction' pop-up window will be displayed.

If intending to use the DIALOG_PICKFILE function to select input files, the user can set the 'Path', 'File' and 'Filter' function parameters to reflect the directory and filename structure on his/her computer. This function is used in the idlcr8ascii procedure.

Any output files will be named based on the input HDF filename. The file containing Metadata information will be given the extension .meta, and the file containing Data will be given the extension .data. The files will be placed in the program directory. If files of the same name already exist, they will be overwritten without any warnings. If a keyword is not one of the above three options (or shortened versions of the above), the program will stop with a Keyword Call error.

If idlcr8ascii is called with no parameters, and the user continues beyond the 'Introduction' dialog box, then output to session memory is not available as an option.

If idlcr8ascii is run on IDL5.5 or less, then the option to read HDF5 files is not available. An error message will be displayed and the program will stop if the file is not HDF4 in this case.

2.2 Command Line Input Parameters

2.2.1 HDFFileSpec

The input HDF file(s) can be in the form of a single filename, or a set of filenames described by a single file spec (e.g. FileSpec*.hdf), or a set of single filenames saved in a string array, or a null string (which will open a DIALOG_BOX to prompt for input(s)). If the program detects that the input file is not a valid HDF4 or HDF5 file, an error message will be displayed and the program will stop.

2.2.2 GA

A one-dimension string array, returned by the procedure, containing the Global Attributes saved in the HDF file.

Each entry to the array is of the form label=value. A full list of the Global Attribute labels used by the AVDC/NDACC/ESA Envisat (NILU) databases is available from the AVDC Metadata Guidelines document (see downloadable document on the web site http://avdc.gsfc.nasa.gov).

2.2.3 SDS

SDS is a heap variable structure using pointers. The structure has N_SDS pointer arguments (where N_SDS is the number of datasets saved in the file), and consists of the

Data values (SDS.Data) and the Variable Attributes (SDS.VA) of each dataset. For example, to view a set of dataset attributes, type:

print, *SDS(n).VA, *where n is an N_SDS dataset index.*

To access individual values of a dataset, the contents can be transferred to an array by, for example, typing:

SDS_Data_Hold=*SDS(n).Data

This retains the array dimensions and data format of the original structure.

Each Variable Attribute entry is of the form label=value. A full list of the Variable Attribute labels used by the AVDC/NDACC/ESA Envisat (NILU) databases is available from the AVDC Metadata Guidelines document (see downloadable document on the web site http://avdc.gsfc.nasa.gov).

Please note that the returned GA and SDS parameters can be used as inputs to IDLcr8HDF, to put the data back into HDF format.

2.2.4 /AVDC or /A

Generates two ASCII files (*.META and *.DATA, where * is the name of the input file excluding the HDF file extension). The .META file contains all the metadata information, and the .DATA file contains the data listed in a single column. These files can be used as inputs to HDF write programs (e.g. cr8HDF, IDLcr8HDF), to put the data back into HDF format. Note that this option is mutually exclusive with the /Dump option. In the event that both are called, the program will perform the /AVDC option only.

2.2.5 /Dump or /D

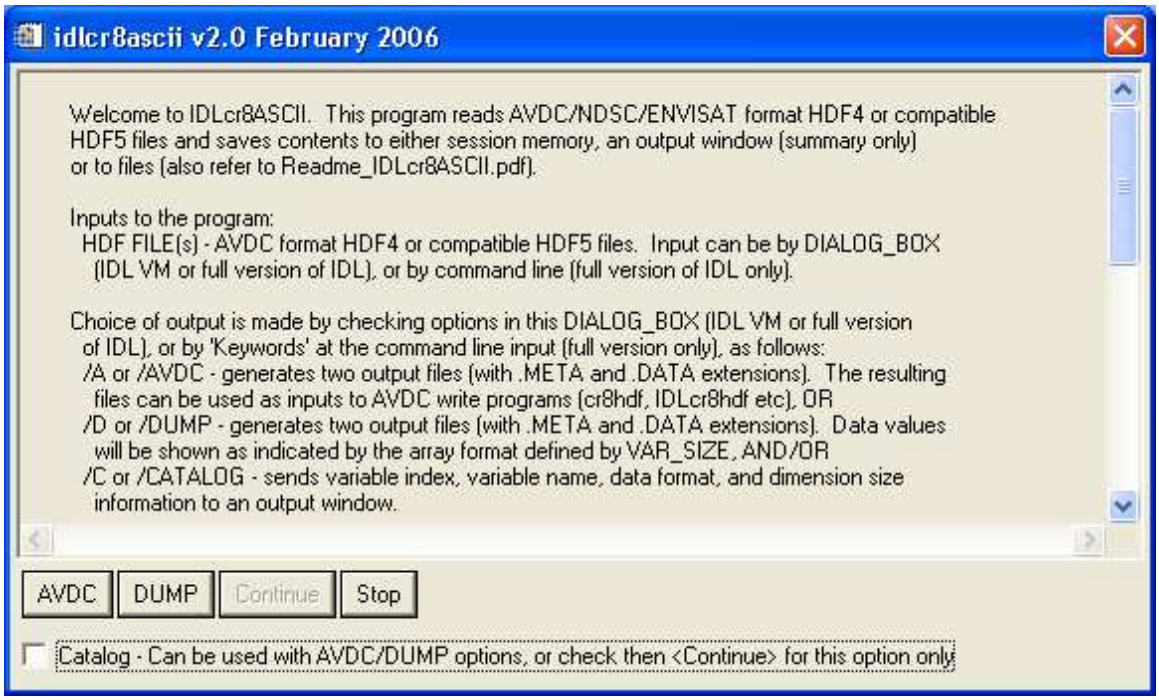
Generates two ASCII files (*.META and *.DATA, where * is the name of the input file excluding the HDF file extension). The .META file contains all the metadata information, and the .DATA file contains default formatted data in array order. IDL automatically determines the number of data values per line, according to the length of the data value. Please note that, in this format, the *.DATA file cannot be used as input to HDF write programs. Also see the note above regarding calling both /AVDC and /Dump options.

2.2.6 /Catalog or /C

Generates a summary listing of the variable attributes in the IDL output log or a pop-up display window, including: The dataset index; the dataset variable name; the dataset data type; and the dataset array dimensions. Note that this option can be called together with the /AVDC or /Dump keyword.

3 Running idlcr8ascii.sav on IDL VM or IDL LIC

The file idlcr8ascii.sav is the binary version of idlcr8ascii.pro and can be run on IDL VM or IDL LIC. To run it on IDL LIC in the manner described in Chapter 2, the routines needs to be restored (restore,'idlcr8ascii.sav'), and the main procedure called (idlcr8ascii). To run on IDL VM, open IDL VM, and select idlcr8ascii.sav. The following 'Introduction' window will be displayed:

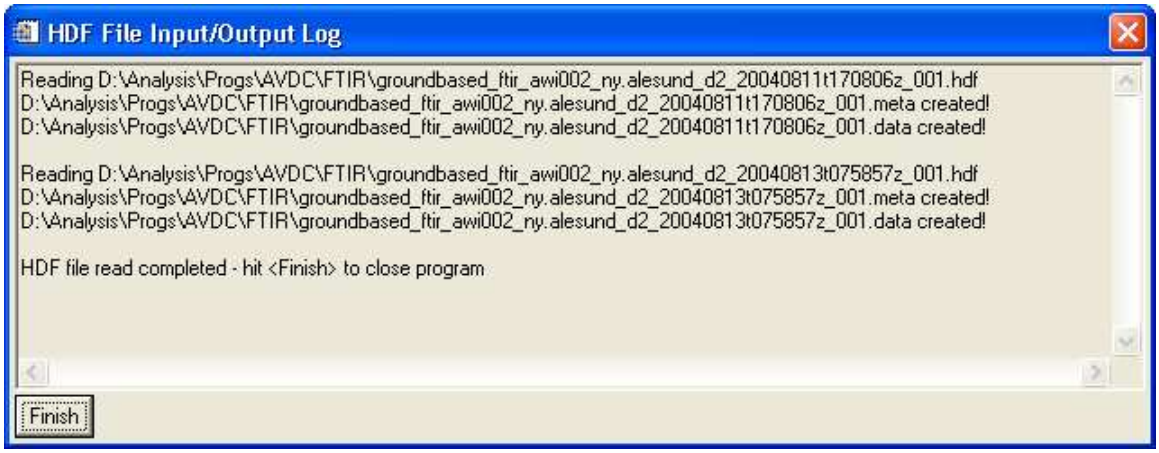


Output options are selected by a combination of exclusive and non-exclusive buttons as follows:

- AVDC – This is equivalent to choosing the /AVDC option at the command line (refer to section **2.2.4**). This button is exclusive, meaning no other options are available once it is selected.
- DUMP – This is equivalent to choosing the /DUMP option at the command line (refer to section **2.2.5**). This button is exclusive.
- Continue – This button is active only if the Catalog option is chosen, and is used if the AVDC or DUMP options are not required. This button is exclusive.
- Stop or X – the Program will close.
- Catalog – This is equivalent to choosing the /Catalog option at the command line (refer to section **2.2.6**). This option is non-exclusive, meaning other options are still available if this is selected.

Once the AVDC, DUMP, Continue, or Catalog options are selected, the program will prompt for input HDF file selection by Dialog Boxes. Multiple file selection is permitted (also refer to section **2.2.1**).

If the input files are valid AVDC/NDACC/Envisat HDF files then the program will create the requested output. A log window, like the one below, shows progress through the operation. The program will stop once all input files have been successfully read, or an error is detected. To close the program, select the Finish button.



4 Procedures

4.1 idlcr8ascii

The main procedure called by an external program or at the IDL prompt. It receives input files and display options either via the command line or via Graphical User Interface, and tests that the input file(s) are in HDF format. If successful, the procedure then calls the HDF read procedure and, if keyword options are present, the procedure to output the contents of the HDF file in ASCII format files, or a summary of the contents to the output log.

idlcr8ascii is set-up to display a run-time log in different ways, as follows:

- If idlcr8ascii is called from another program, or from the IDL Command Input Line, then output will be to the IDL DE output log window.
- If idlcr8ascii.sav is opened in IDL VM, then log output will be written to a pop-up display window. The program will remain open until the display window is closed.

4.2 idlcr8ascii_Common

This procedure defines the common blocks used by the program.

4.3 Intro_A_Event

Called by the Intro_A procedure. This procedure controls what happens when a Widget Button is selected in the Introduction display window.

4.4 Intro_A

Displays the Introduction display window, and allows the user to continue running the program after choosing from the available options.

4.5 idlcr8ascii_Event

Called by the Stop_With_Error_A procedure and the idlcr8ascii procedure. This procedure closes the pop-up display window and ends the program when the Finish Widget Button is selected.

4.6 Stop_With_Error_A

Called if there is an error with the input file, or with the format of the datasets. The error is displayed in a pop-up display window and/or the IDL output log, and the program is stopped in a 'clean' manner (closes any open files etc).

4.7 JDF_2_DateTime_A

A function which has as input the Julian Day, or the date in MJD2000 format, and returns a floating point array in the form [YYYY,MM,DD,hh,mm,ss.sss], or a string in the form YYYYMMDDThhmmssZ, or a string in the form YYYYMMDDThhmmss.sssZ. Used for converting the Global Attributes DATA_START_DATE and FILE_GENERATION_DATE to ISO8601 format (ISO, 1998).

4.8 Read_HDF_SDS

This procedure opens and reads the Global Attributes and the contents of the Datasets. Global Attributes are assigned to a string array (GA), and the Data and Variable Attributes are assigned to a structure (SDS). The program checks that the number of dimensions making up each dataset in the file is less than or equal to eight, and also that the data type is one of the four allowable types (integer, long integer, real (floating point), or double precision). In both cases the program stops with an error message if there is a problem. If the procedure cannot determine the number of Global Attributes or Datasets, in the input file, it will also stop.

4.9 Output_HDF_Data

This procedure is called if the contents of the HDF file will also be written to file(s), the output log, or to the logging display window.

5 Acronyms

AVDC	Aura Validation Data Center
ENVISAT	European Space Agency satellite
ESA	European Space Agency
HDF	Hierarchical Data Format
IDL	Research Systems, Inc., Interactive Data Language
ISO	International Organization for Standardization

MJD2000	Modified Julian Date 2000
NCSA	National Center for Supercomputing Applications
NDACC	Network for the Detection of Atmospheric Composition Change (ex-NDSC)
NILU	Norwegian Institute of Air Research
RSI	Research Systems, Inc.
SDS	Scientific Data Set data object in HDF

6 Version History

v1.0 – Initial version release June, 2005.

v1.1 – Bug fixes and improvements as follows (release August, 2005):

- Change procedure heading format and order to allow library calls.
- Remove COMMON block.
- Make output filenames lower case.
- If the format of the DATA_START_DATE and FILE_GENERATION_DATE values is MJD2000, then change to ISO8601 (except original format used for /DUMP output option).
- Replace JULDAY function call (i.e. JULDAY(1,1,2000,0,0,0)) with the actual value (2451544.5D).
- Check that the attribute variable names read by HDF_SD_GETINFO, match those recorded in DATA_VARIABLES in the Global Attributes. If not use the variable name listed in DATA_VARIABLES.
- Add fix to ensure properly formatted output if VAR_DATA_TYPE=DOUBLE and output option is /AVDC.

v2.0 – Modifications to the code as follows (release October, 2006):

- Introduce option to read HDF5 versions of the AVDC files that have been created with either idlcr8hdf or cr8hdf.exe (needs IDL5.6 or greater).
- Make the code suitable for running on a licensed version of IDL (using the .pro and .sav versions of the code) and on IDL Virtual Machine (using the .sav version of the code).
- Change the command line keyword options. Remove the /Help (window now opened if there are no command line parameters), and /Catalog can now be called together with /AVDC or /Dump.
- The program can now handle multiple HDF files as input (either as a string array or as a file spec).
- Display input/output information as well as errors and warnings in a pop-up display window if the program is opened using IDL VM.
- Help window becomes an Introduction window, and the user has the option of continuing to run the program with file inputs.
- Change names of some procedures (by adding _A), so they do not have the same names as procedures in idlcr8hdf.

7 Testing

This program was written and tested on a Windows platform using RSI IDL version 6.3, and NCSA HDF library v4.1r5. It has also been tested on Linux (Debian GNU/Linux 2.6) and Apple Macintosh OSX (10.3, 10.4) platforms using RSI IDL version 6.1.

8 References

B.R. Bojkov, De Mazière, M. and R. Koopman, Generic metadata guidelines on atmospheric and oceanographic datasets for the Envisat Calibration and Validation Project, Version 01R001, April 23, 2002.

ISO, "Representation of Dates and Times", ISO 8601:1988, International Organization for Standardization (ISO), Geneva, Switzerland, (1988).

Research Systems, Inc, "IDL 6.1 Quick Reference", RSI, July 2004, Boulder, CO 80301.

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